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4 February 1981

East Europe Report

SCIENTIFIC AFFAIRS

No. 693

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NEW DNA PRODUCTION PROCESS WILL ELIMINATE IMPORTS

Prague ZEMEDELSKE NOVINY in Czech 27 Nov 80 pp 1, 6

[Article by Jan Subert: "Weapon Against Leukemia"]

[Text] There is little doubt that our physicians are recognized the world over for their knowledge and skill. But there is increasing evidence that retaining the good name of our health care will require the contribution also of other sectors. Each year brings new and more advanced--albeit also many times more expensive--instruments and drugs whose development and production is usually beyond the means of small countries. Hitherto this has also been the case of a drug against leukemia whose import, only this year, cost 3.5 million korunas. Now the laboratories of the Czechoslovak Academy of Sciences report that this expensive purchase on the world market will no longer be required.

The letters DNA--an acronym for the long name of the extremely important deoxyribonucleic acid--are generally known today as the key symbol of all life controlling heredity, development, growth and metabolism in every organism. That this remarkable substance was first extracted in the laboratory from cellular nuclei by Friedrich Miescher, a skillful chemist and experimenter from Basel as far back as in the summer of 1969, is less well known.

And no wonder. The substance remained in bottles on laboratory shelves as a powder of no importance for the next several decades. In science the focus was on proteins and nobody had any idea that a 19th century researcher had unwittingly stumbled onto the secret of the very basis of life. Awakening came only in 1944 when the American physician Avery reinvented DNA as the carrier of genetic information.

The most exciting moment of this dramatic event--everybody wanted to know what DNA looked like, what its structure was, how it was inscribed and how the genetic code was transmitted--came during the nocturnal trip from London to Cambridge of the "forever hurried" 23-year-old American biologist James Watson. It was here in the railway carriage where the idea dawned on him which, after much meticulous work and the participation of his English coworkers Crick, Wilkins and Ms Franklin, sparked in 1953 the genetic scientific explosion by the discovery of the famous double spiral.

But the precipitous developments in molecular biology and genetics also gave modern chemistry a tremendous boost to engage in intensive study of the cellular nucleus.

All famous laboratories including also the Institute for Organic Chemistry and Biochemistry of the Czechoslovak Academy of Sciences became involved and the involvement soon yielded a remarkable result. It appears that of the chemical methods, nucleic acid is one of the approaches to combatting cancer, one of the most feared scourges of modern civilization. But let us now tell the story by Eng Jiri Beranek, DrSc, one of the leading scientific workers of the above institution.

"We have been engaged in nucleic acid research since 1958. We lived through both the wave of enthusiasm when chemicals were considered an almost miraculous cure against cancer and the disappointment which set in in 1964 when everybody began giving up on chemicals. But knowing that chemotherapy, together with other methods, has a legitimate place in the fight against cancer, we continued in our effort to find a production method for substances whose importation is expensive and which our pharmaceutical industry needs."

Of 750,000 substances compounded in the world which are believed to possess the ability of destroying cancer cells, 75,000 were tested but only a few dozen--due to enormously strict criteria--are currently authorized for use in clinical practice. Four are nucleic acids, one of them arabinofuranosylcytosin.

In the words of Dr Beranek "this compound, very effective in leukemia therapy, is being produced in the United States and the FRG by a very expensive and complicated multi step synthesis and the price is commensurate--1 million korunas per kilogram. But the substance is indispensable for effective therapy against this pernicious disease and only this year we are forced to import 3.5 kilograms. Of course, the need is much greater but the substance is not being produced in CEMA countries and foreign exchange for imports from world markets is scarce. Luckily, we have found a way of producing the substance domestically."

The method, whose authors in addition to Dr Beranek are RN Dr Josef Brokes and Eng Hubert Hrebabecky, CSc, is based on a simple synthesis requiring no investment nor special equipment. Manufacture was entrusted to the national enterprise Leciva Modrany in July 1979 which this year produced the first experimental batch of 1.2 kilograms of the compound.

The pharmacokinetic tests performed by the Pharmacological Institute of the Czechoslovak Academy of Sciences were wholly satisfactory and results identical with those of the imported product. The results of clinical tests should be available by next July. If they are positive--and all indications point that way--it is expected that large-scale production can start by the end of 1981 or in the beginning of 1982 at the latest. Moreovr--thanks to the highly original process--it is expected that a single worker will be able to produce the quantity needed in the time required.

Drugs, indispensable in modern life, represent a sizeable expenditure in our national budget--about 2.5 billion korunas a year. With that, over the past 30 years expenditures for their development and production have increased more than 100-fold. In addition, exceedingly strict regulations designed to ensure maximum protection of human health have extended manyfold the time period between the discovery of a new drug and its large-scale production. In cytostatics (drugs which arrest malignant proliferation) research--aiming at destroying malignant but conserving healthy cells--can be compared to the performance of a wiredancer who cannot afford to make a false step. Therefore, the intermediary time period usually lasts from 15 to 20 years.

The three scientists from the Institute for Organic Chemistry and Biochemistry who, by choosing an unusual but faster and less expensive method to save human lives, have succeeded in finding a way around the time and money barriers have, therefore, rightfully received the annual meritorious award of the Czechoslovak Academy of Sciences for the accomplishment which is so important to us and the entire socialist community.

The scientific team of which discovered a simple method for the production of a hitherto expensive imported drug photographed by our press photographer at the pilot plant, representing an important link between basic research and large-scale production. From right to left Dr Beranek, Eng Hrebabecky and Dr Brokes. In the inset are crystals of the organic compound arabinofuranosylcytosin whose cost--the contents of the dish are worth 40,000 korunas--equals that of gems.

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CSO: 2402

PROTEIN PRODUCTION FROM PHYTOPLANKTONS FOR HUMAN, ANIMAL CONSUMPTION PLANNED

Bratislava NEDELNA PRAVDA in Slovak 7 Nov 80 p 6

[Lubomir Lenoch interview with Professor Eng Anton Blazej: "Phytomass as an Industrial Raw Material"]

Professor Engineer Anton Blazej, DrSc.

[Text] Corresponding member of the Czechoslovak Academy of Sciences [CSAV] and the Slovak Academy of Sciences [SAV] Professor Engineer Anton Blazej, Dr of Science, was born on 10 March 1927 in Nemsova, Trenciansky Okres. His brief biography as student and pedagogue is as follows: he was a worker, a student at the Evening Industrial Chemical School in Gottwaldov, and in the Department of Chemical Engineering of SVST [Slovak Advanced Technical School] in Bratislava, and an assistant, docent, extraordinary professor and regular professor in that department. Currently

> he is the rector of SVST in Bratislava. He began is dissertation work for his candidate degree in 1959 and that for his doctor's degree in 1972. He became a corresponding member of CSAV and SAV in 1975. He is an honorary doctor of the Moscow Power Institute. He joined the KSC in 1948. His work is in the field of biopolymers, and focuses on the structure and properties of proteins, polysaccharides and polyphenols. He is a member of the Scientific Collegium on Chemistry of SAV and a member of the SAV Presidium, a member of the Clement Gottwald State Prize Committee, a deputy to the Chamber of Nations of the CSSR Federal Assembly, a member of the Presidium of the CSSR Federal Assembly, chairman of the Committee on Industry, Transport and Commerce of the Federal Assembly's Chamber of Nations, chairman of Czechoslovak-Japanese Interest Group on Interparliamentary Unity, a member of the UNESCO Commission on Foodstuffs and chairman of the Association of Deputies from the city of Bratislava. He has received the Clement Gottwald State Prize (1972) and the award For Service in Construction (1977).

We went to the large auditorium of the Department of Chemical Engineering, SVST, as SVST rector Prof Eng Anton Blazej DrSc was concluding a long paper at a scientific seminar. This seminar of the department's branch of the Czechoslovak Scientific and Technical Society, held in early October, also included other individual and joint reports. All dealt with raw materials in terms of the long-term development of the chemical industry in Czechoslovakia. Professor Blazej made some suggestions regarding the utilization of so-called "phytomass." As he himself noted, this term has seen hardly any use so far in scientific literature. It refers to biomass in the form of green plants, i.e. phytoplankton, annual plants and trees. And what about them? How can they be used without leaving a residue? And can they be a potential raw material for our chemical industry? These are the questions which we posed to Professor Blazej, a leading expert and scientist in the phytomass field. To introduce our conversation, a strange question:

[Question] Comrade Rector, in your paper you directed attention to the fact that it would be promising to evaluate the use of phytomass for the production of protein. Does this involve some nontraditional approach?

[Answer] Yes. There is not enough protein in the world. A human requires from 1.2 to 1.9 grams of protein per kilogram of body weight every day. As an optimal requirement, this averages 90 grams a day per person. The ratio of animal to plant proteins is 60:40. The annual individual requirement of animal proteins is 20 kilograms. In the future it will not be possible to assure a sufficient quantity of the proteins required for complete human nutrition by the traditional method of plant and animal production. Accordingly we in the CSSR must organize a program for the production of microbial proteins, in the first phase for nourishment of domestic animals, and in the second directly for nourishment of the populace. With the current method of producing 114 kg of meat protein, 5,320 kg of grain is required as the main feed. If this quantity of grain were used in mocrobiological protein production, we could obtain about 1,400 kg of protein. This is more than 10 times the amount obtained from livestock production. At the same time, this method is less energy-intensive, has a smaller requirement for manpower and produces better nutritional value.

[Question] This is all very well, but how can microbial protein be processed so that people can consume it like meat? The human organism must receive part of its protein as a fibrous substrate so as not to disrupt the physiological function of certain organs.

[Answer] These proteins can be used in the form of globular proteins to produce "synthetic milk" and powdered additives for pastry, bread and the like. Another possibility is the production of fibrous protein, i.e. its formation into fibers followed by production of fiber sheets, either by the wet method, as paper is produced, or by the dry method, the so-called "nonwoven textile process." This makes it possible to produce "endless strips," to weave them togehter as needed and to "cut" them into steaks, filets and the like according to the consumer's requirements. Addition of flavor and aroma ingredients makes it possible to imitate the natural properties of pork, beef, lamb and poultry.

[Question] Then steaks made from wood are a realistic prospect, even if this seems like science fiction?

[Answer] Yes. We have organized a research project within SCAV, SAV, the higher schools and the departmental institutes for comprehensive development of phytomass, with one approach being the microbiological production of protein. It may suffice to offer only the following argument in support of this approach: if we were to process only the grain straw from the West Slovak Kraj, about 1.5 million tons of it, we could completely meet the requirement for animal proteins of 5 million citizens, i.e. for the entire Slovak Republic, by microbiological protein production. In addition, we would produce other products and return the residue to agriculture as high-quality organic and mineral fertilizer. The implementation of this processing method is not the "music of the future": it is a realistic prospect even before the year 2000.

[Question] Then it is not the "music of the remote future." But this is a small part of the long-term program for the use of phytomass in industry. How would you characterize the orientation of the Czechoslovak chemical industry up to now, and how can it use phytomass as a chemical raw material?

[Answer] The approach of chemical production in the past was correct. It has been performing the function of chemicalizing the national economy. This is why the large-scale production of plastics, synthetic fibers and synthetic fertilizers has been organized. Without these chemical products it would not be possible to develop machine building, electronics, consumer goods and construction successfully and to intensify agricultural production. But the production of so-called "low-tonnage products" has been stifled, or has not expanded as much as we have needed. These products include pharmaceuticals, additives for plastics and rubbers, detergents, cosmetics and the like. These products account for only about 5 percent of the total chemical output in Czechoslovakia.

[Question] What new sources of carbon are being discussed in this country as raw materials for chemical processes?

[Answer] Currently we see three realistic sources. The first is carbon dioxide from air, combustion products and mineral waters. The second is inorganic carbonates and the third is phytomass.

[Question] You discussed phytomass in your presentation. Could you explain more precisely what the term means?

[Answer] We can divide all living organisms into two basic groups according to what energy sources they use for their growth and physiological processes. One group uses solar radiation as the energy source and carbon dioxide from the air as the carbon source. These are photosynthetic plants which, as I stated in my discussion, include phytoplankton (water plants), annual plants (agricultural plant products) and trees. Thus far, under our conditions we have available primarily tree phytomass and phytomass from annual plants. We are also beginning to give attention to algae for nutrition and as an industrial raw material. The second group of organisms uses chemical energy as the energy source and organic compounds as the carbon source. These are animals and microorganisms.

[Question] Every schoolboy knows that we are not treating tree phytomass with the requisite respect and are not using it economically.

[Answer] Unfortunately this is true. Currently in Czechoslovakia we cut about 60 million cubic meters a year. But this includes only trunks measuring 7 cm in diameter or more. The figure does not include the so-called "small-dimension wood": branches, trunks, roots, greenery (leaves and needles), which represents nearly half of tree phytomass and which remains in the forest after logging. These secondary sources of raw materials in the forestry industry represent approximately 8 million cubic meters of wood in Czechoslovakia. Naturally, part of this waste must remain in the forests in the interest of the ecological cycle of matter. Still, there is untapped potential of which the forestry industry has thus far not been able to take proper account. Another source is so-called "processing waste" in the mechanical processing of wood, of which there is 3.5 million cubic meters and is only partially utilized. A calculated 2.6 million cubic meters of waste is produced in the production of cellulose and paper, but this is only partially accounted for. A third source is consumption waste: paper and hardboard, of which only 27 percent is recycled as a secondary raw material, while in the West the figure is 50-60 percent. Similarly we have not accounted for wood wastes in the form of wood packaging materials, construction waste, old furniture and the like. All of these sources offer good raw materials for chemical processing.

[Question] It can be stated without any exaggeration that a period of struggle for wood as a raw material is beginning. How can we assure that there will continue to be a sufficiency of this raw material, even for chemical processing?

[Answer] First it must be stated that two large cellulose producing combines are under construction in Czechoslovakia, in Ruzomberk and Paskov, with a total capacity of 400,000 tons a year. Combines for the production of large-size fiberboard and chipboard panels are currently being built. The impression may arise that there will not be sufficient raw materials for chemical processing of wood. Personally I believe that there will be a relatively adequate amount of wood phytomass even for the chemical industry. This will entail, first, intensification of forest harvesting, i.e. production of wood chips from small-dimension wood. The first attempts began in East Slovakia with the processing of wood chips from beechwood. This requires the development and production of ZTS [Heavy Engineering Plants] in Martin of equipment--small-dimension wood shredders--based on a wheeled lumbering tractor, which is of very good quality. Currently it is necessary to combine this equipment with a lumber robot for tree cutting so as to produce a modern comprehensive system for cutting, lopping branches, sawing, grading and transport in the forestry industry.

I think it necessary to advance to new relationships between the forestry industry and the lumber, cellulose-paper, and chemical industries in terms of our conception of comprehensive wood processing. The forestry industry will have to plan for modernization of lumbering, including its automation with robots and technical preparation of tree phytomass for the individual processing sectors. Trunks will be used primarily for construction material; the small-dimension wood will be used for production of chips and, after grading, partly for the production of cellulose; the greenery will be used for fodder or as a source of vitamins and protein. The remainder after grading will be used for processing in the chemical industry.

[Question] Will we be able to solve the problem of fast-growing trees?

[Answer] The focus on fast-growing trees is realistic in our climatic conditions. Currently our conifers will last us for 80 years and our deciduous trees for 100 years or more. Worldwide there is a tendency to change over to production forests or energy forests, which in the case of plantation growing of certain genetically improved trees shortens the growth cycle to 10-15 years. In Slovakia this began with the cultivation of poplars as a fast-growing tree, but not with the same intensity or on the same scale as would be necessary. Practical use is now being made in the United States, Canada and Sweden of hybrid larch, pine and poplar, which can be cut at the age of 10-12 years. If we were to reorient part of our forest production toward fast-growing trees, we would increase the production of tree phytomass by at least a factor of 5. This would require that we devote attention to the genetics of timber trees. The forestry industry must prepare a concept for reorganizing its basic resources in terms of regionalization as regards the cultivation of traditional trees and of fast-growing trees, and areas and forests must be classified in terms of the production functions of their wood. It is also necessary to eliminate disproportionate "early harvesting" in accessible locations and unsolved problems involving overage forest growth.

[Question] According to you, annual plants must also be included among the important sources for production of phytomass.

[Answer] This basically involves agricultural phytomass. Under our conditions, corn makes the greatest growth. Corn stalks and husks represent about 12 tons of dry material per hectare, in addition to about 4 tons of dry grain. This is a total of 16 tons of material per hectare. The total for sugar beets is 9-10 tons, 5 tons for potatoes and 4-6 tons of cereal grain plus straw. We see considerable untapped potential for raw materials in agricultural phytomass. This requires a change of views and approaches in agricultural and animal production. Currently we need up to 10 joules worth of fossil fuels (industrial fertilizers, transport, mechanization, machinery, and the like) to produce 1 joule's worth of foodstuffs, which is unprofitable in the long run. The farmers must get on the path of energy self-sufficiency. Large agricultural complexes could, with effective evaluation of phytomass, and after hydrolysis, produce alcohol for transport purposes (replacing petroleum and gasoline), and could use the residue to produce biological gas [methane] for heating and the production of organic fertilizers. I do not consider that the farmers' trend toward the use of wood waste to produce feed proteins and fertilizers is promising. On the contrary, agricultural phytomass must be used to nourish domestic animals and to produce organic fertilizers, and at the same time to solve the problem of energy in agriculture. This entails new views on the comprehensive utilization of agricultural phytomass.

[Question] What can be produced from phytomass as a chemical raw material?

[Answer] Up to 90 percent of the basic petrochemical products produced today. Essentially, it is possible to produce all the basic monomers for the production of synthetic polymers, i.e. polyolefins, polyamides, polyesters, polyacrilonitrile and the like. Great potential is offered by so-called "hybrid" polymers based on modifications of cellulose with 10-20 percent of monomer. We can obtain from this type the advantages of biopolymers (for instance biodegradability), and those of synthetic polymers (heat forming, size stability, hydrophobicity and the like). In addition there are possibilities of for the production of composite materials based on fibers (wood, cellulose) and synthetic polymers.

* * *

Comrade Blazej gave, one after another, an astonishing number of suggestions for the use of phytomass in the chemical industry and the national economy in general. Starting from the raw materials base of phytomass, it is possible among other things to support a program of small tonnage chemical products based on cellulose derivatives, for the pharmaceutical industry, clinical diagnostics and the production of biologically active materials, absorbents, enzymes and the like. This involves a particularly good evaluation of cellulose, since it can be used to produce products which have not previously been produced in Czechoslovakia and which could be exported. For example, the low-tonnage chemistry field includes production of biodegradable detergents based on sugars and sugar derivatives, and the production of many catalysts, antifreezes, fungicides, insecticides, pharmaceuticals, additives for the foodstuffs industry, flavorings, scents for the cosmetic industry and the like. No less interesting is the area of organic fertilizers, for whose preparation tree bark can be used. In addition there is chemical power production. This includes possible production of hydrogen, methyl alcohol, ethyl alcohol, biogas [methane] and the like.

In my conversation with SVST rector Eng Anton Blazej, Dr of Science, many suggestions, ideas and stimuli were touched on. All are in accordance with the requirement of the KSC's economic policy--in particular those regarding full utilization of wood as a raw material which were enunciated at the May and November 1974 sessions of the KSC Central Committee and at the 15th KSC Congress. Those concerned should not only consider them, but also become involved with them.

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CSO: 2402

ADVANCES, PROBLEMS OF INDUSTRIAL ROBOT PRODUCTION DETAILED

Prague LIDOVA DEMOKRACIE in Czech 6 Nov 80 p 6

[Article: "Robots No Longer Go Begging -- Even Here"]

> [Text] "I think that the most important question for us now is not where to get robots, but rather where to make practical use of them. It is true that industrial robots or manipulators can be used practically everywhere, in perhaps all areas of human activity; but it is one thing to want them and quite another to prepare suitable working conditions for them. More specifically, this means being able to think out and organize their work so perfectly that robots within the production line will not act as 'dust in the eyes,' but rather as a harmonious part of it." It was with these words that Eng Vladimir Cop, Candidate of Sciences, welcomed us to the Research Institute of the Metallurgical Industry [VUKOV] in Presov, adding: "It is rather a far cry from our robots here to the ones created by their spiritual father, Karel Capek, or to those described in various types of science fiction, but in the last two years we have managed to teach them many useful things."

Machines that really think, that speak and act independently like their human creators, still exist only on paper and in the imaginations of cyberneticists or science fiction writers. The day when such robots might become an everyday phenomenon is still too far off for us, even though we have moved somewhat closer to it--at least in comparison with the generation of Karel Capek, who was the first to give the man-machine the name of "robot." We are, to be sure, wiser by the knowledge that man will have control of robots everywhere and that the direction of development of robots and of their uses depends solely upon humans.

At present there exists nowhere in the world an industrial plant operated only by robots and automated devices rather than by people, but the number of workplaces with fully automated production systems is increasing steadily year after year. Industrial robots, automated devices and manipulators are used on the most massive scale in the United States and especially in Japan. According to the latest data Japan now has 120,000 industrial robots in place, and many plants there have fully automated most of their operations. And what is the current situation here?

Two years ago when we were at the Research Institute of the Metallurgical Industry, which as one of this country's advanced workplaces is concerned with the study, development and application of automated production systems using industrial robots and manipulators, the estimate of the situation then was roughly as follows: as regards the extent of introduction of robotics into production practice, we were roughly 4 to 5 years behind the worldwide state of the art, while as regards the technical standards of our automated production system components, the shortfall was about 8 years. During the last 2 years, however, the situation has changed considerably and although the limiting factor is still primarily the level in microelectronics and hydraulics (!), VUKOV has succeeded in making excellent progress (in spite of the fact that the institute also had to solve problems of insufficient capital construction). On that occasion, for example, we saw the PR-16 industrial robot when it was still in the experimental model stage and preparations were being made for production of the first 10 prototypes. Currently its production has been undertaken by ZPA [Machinery and Automation Plants] in Presov, and the PR-16 has received certain modifications. This type of robot is still to some extent on the borderline between robots and "ordinary" manipulators, and in layman's terms it belongs in the category of "stupid" robots. Currently the institute is carrying on prototype experiments with the PR-32-E industrial robot, which in contrast to its predecessor has electric instead of pneumatic drive, and--more important--will be the first true industrial-process robot. This means that its operating programs will no longer consist only of handling the workpiece or the simplest types of operations with it, but instead it will become a real part of the production line. Its "kit" will include a welding unit, and it will be used for arc spot welding. In addition, consideration is also being given to using it in such places as TESLA Roznov, where it would be used for rather complex manipulation of color television units; a simple manipulator would not be able to handle this work. Next year the first pilot series should come into existence at VUKOV, while a year later ZTS [Heavy Machinery Plants] in Detva should undertake its production. In cooperation with some of our other research institutes, new and improved types of industrial manipulators have also come into being, such as the M-63-01 gantry-type manipulator, which is used in machining shaft components on grinding machines, the MTL-06 manipulator for tending pressure casting machines (which is a modification of the M-63 manipulation system), the RMS-20 hand manipulator and the like. Production of the two first-named manipulators is now beginning at Vihorlat Snina.

It is also gratifying that by the end of this year 22 industrial workplaces will be equipped with certain of the robots or manipulators mentioned. For example, lines for machining the S-105 front axle bearing at the Praga Kutna Hora plant will be equipped with PR-16 robots, as will the lines for machining brake shoe cams at the Liaz plant in Mnichovo Hradiste and a machining line at ZTS Bardejov, among others. Also of importance are the results of cooperation with similar research institutes in other socialist countries, for example, the production of a robot to apply protective coatings is being worked out with Bulgarian experts.

But let us return to the basic question, that of broader practical application. The average price of an industrial robot or manipulator is between 300,000 and 600,000 korunas (for the present, of course), and VUKOV is trying to see to it that this equipment goes only to the workplaces which guarantee payback of this investment in a maximum of 5 years. The average payback period at present is 3 years or less. As has already been stated, more extensive utilization of the equipment is also being hampered by lack of preparation on the part of potential users. For example, VUKOV assumed that during the Seventh Five-Year Plan 2,000-3,000 robots would be put into use; but more precise marketing has indicated that possibilities for their utilization will be much lower--only a few hundred, which in turn depends on suitable high-quality preparation of each workplace. And one thing more: In addition to the often-discussed level of microelectronic components, the institute in Presov is also having problems with shortages of hydraulic components. It would seem that in this case too our producers have "overslept"; but it will not be possible to solve the problem indefinitely by import.

The ML-16 automatic manipulator is already being used at the East Slovak Iron Works to tend a press producing panel type radiator surfaces.

The PR-32-E industrial robot is already in the category of manufacturing-process robots.

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CZECHOSLOVAKIA

ADVANCES IN PHARMACOLOGIC CONTROL OF BIOLOGICAL PROCESSES IN LIVESTOCK

Prague LIDOVA DEMOKRACIE in Czech 22 Nov 80 p 6

[Article by Jiri Franek: "Sci-Fi for the Veterinarian and Cattle Breeder--Oestrophan Is Just a Beginning"]

[Text] Brother Ing Frantisek Reichel, CSc, doctor of veterinary medicine, the manager of the department for clinical research and scientific technical information in the Biofactor and Veterinary Pharmaceutical Research Institute and a member of the Czechoslovak People's Party Central Committee, says: "Just send them to me and I'll explain it to them. Send them to me and I'll ask them whether they know any better solutions."

So I pass his message on to the readers who will not find this whole issue much to their liking. Let those who have any better solutions come forward.

Nevertheless, I can understand....The whole issue is not much to my liking, either. Few people would enjoy it, but there is no other choice because people want to eat. Everybody wants to eat. And thus, livestock-raising methods must turn into a kind of industry, with everything that goes with it.

In fact, it has already turned into an industry and therefore, let us look at it as such.

What does it mean? Brother Reichel put it in the following way: "It involves methods to improve the quality of the process of reproduction." Translated into the language we laymen can understand, this means approximately the following: the problem is how to turn the biological potential of animals to our best advantage, and furthermore, how to adapt natural processes to conditions that are almost industrial, precisely in the most complex area (where, however, the anticipated contribution is the greatest), in cattle-breeding.

The Spofa Company will launch mass production of Oestrophan, a new Czechoslovak drug synchronizing estrus, but it is supposed to be just the beginning. However, it is a great achievement in itself because it resolves a major problem for mass production. First pregnancy may be "arranged" in groups of heifers--in other words, the whole group of animals will always go through an exactly identical period in their reproductive cycle. Not only milch cows but also calves born on practically the same day will form homogenous groups.

People who have some idea about modern animal production know that high productivity of labor with the least workers obtaining the highest possible number of animals can be achieved in no other way but by dividing the animals into groups approximately according to the period of reproductive cycle in cows. All that used to be approximate--until we got Oestrophan.

Brother Reichel insists: "Really, this is just the beginning. We must realize one thing, or rather, now we realize and are doing something about it--we need comprehensive pharmacological control of biological processes. Thus, we set up our research program to the year 2000. After all, there are many problems that need solution."

Naturally, this research program reflects the needs of veterinarians, or more precisely, it focuses on what the veterinarians need in order to be able to satisfy economic demands in the best possible way. That means--from point one to point six: Having an early start in the process of reproduction in animals (because there is no sense in feeding nonproducing heifers for nothing); having an unextended process of reproduction (because excessively long intervals between one birth and another pregnancy mean economic losses); having animals enter the process of reproduction in groups (as already explained) so that most of the calves that are born grow up healthy (no need to comment); producing more calves from each cow (again, for economic reasons); utilizing the breeding fund of top quality animals to the greatest advantage (naturally, because we want to obtain more top quality milch cows).

Some progress has been made in many of these directions. Some years ago the Research Institute for Biofactors and Veterinarian Pharmaceutics developed, for example, a new product (foam) for the treatment of a pathologically prolonged period between one birth and next pregnancy. The researchers, however, are considering some other options for reducing that period--it is biologically possible for every cow to calve annually.

Some other demands of the veterinarians may be resolved as well--often in an interesting way. Thus, for instance, high mortality of calves: death occurs very frequently, usually during birth at night and especially on weekends, yet the delivery may be pharmacologically "induced" to take place during the working hours.

Even tasks that sound rather like a science fiction story are nearing their realistic solution. Methods to induce multiple ovulation are under study--in other words, this concerns fertilization of more than one ovum and the birth of more than one calf (as we know, "natural" twins are very rare among calves). Experiments have been under way for some time, transplanting a fertilized ovum from a prize cow in the uterus of an average cow--again, this cannot be done without a pharmacological "preparation" of both animals.

Indeed, this sounds very much like sci-fi. Anyway, Engineer Frantisek Reichel, ScC, doctor of veterinary medicine, says: "Control of sexual cycles is just as revolutionary as artificial insemination once used to be." It is, however, a task, or more precisely, a whole system of tasks that will make it possible--sometime near the target year of 2000--to bring our cattle breeding up to the level of the year 2000, when direct merger of advanced science and daily practice undubitably will be commonplace and necessary. It also means a great deal of work which is, naturally, beyond the capacities of a single research institute; other scientific institutions have joined the program (Oestrophan was even registered by several inventors, in particular, by Prof Jiri Mostecky, DrSc, of the Chemical Technological Institute. Moreover, this program is unprecedented in the world--there is nothing to copy here, as was possible some years ago in the case of the poultry drugs.

Let us return to the beginning and remind ourselves once again, in order to better understand, what is the purpose of all this effort. It is not some kind of pharmaceutical magic trick producing weird effects by interfering in the most secret biological processes. The intention here is to produce enough meat and milk, which simply cannot be done sufficiently well without pharmaceutic products.

So I deliver the message. To put it briefly, artificial control of the reproductive cycle in animals--and particularly, in cows, because their pregnancy and calving always seemed to be such perplexing problems--is a little frightening because it seems to us that it is "unnatural." But does anyone have a better idea how to go about it in any other way?

9004
CSO: 2402

TECHNOLOGY OF BUBBLE MEMORY PRODUCTION MASTERED

Budapest HETI VILAGGAZDASAG in Hungarian 3 Jan 81 pp 26-27

[Excerpts] Recently the daily press has reported that our country, almost simultaneously with leading world technological powers, has solved the technology of fabricating magnetic bubble memories. The memories, barely the size of half a match box, can store 32 kilobits of information. Mass production of these devices is expected to begin in the middle of the Seventh Five-Year Plan, at best in 7-8 years.

The magnetic bubble memory stores information on magnetized "islets" (bubbles) created in gallium wafers measuring a few square centimeters.

Researchers of the KFKI (Kozponti Fizikai Kutato Intezet, Central Physics Research Institute) considered fabrication of bubble memories as early as 1970-1971; however, an actual research program began only in 1975. At that time, work was shared with Soviet research institutes whose job was to make casings while the KFKI fabricated the wafers. KFKI finished the first 32-kilobit wafers a year ago, but since the Soviet institutes had not yet completed the casings, this work, too, was done in part by Hungarian specialists.

To date, only a few U.S. firms have achieved serial production of bubble memories; Japan has achieved quasi-mass production; France has evolved the technology; the Philips laboratory in Holland is conducting intensive research. The FRG, after considering production, discontinued research and opted for purchase of license. Although a British firm began pilot production a year ago, it was discontinued for business reasons. Among the socialist countries, the GDR in addition to the Soviet Union is dealing intensively with fabrication of bubble memories.

Since bubble memory research is primarily technological in nature, it is correct to ask whether the favorable position attained by Hungarian bubble memories in science can be successfully transposed to industrial mass production. Specialists in the field of high technology, such as bubble memories, think in terms of three stages: the first is whether the device can be made with the given equipment; the second is whether it can be repeated, while the third involves serial production in accord with market considerations.

The bubble memory of the KFKI has just reached the second stage. The trouble is that difficulty in transferring high technology from the laboratory directly to industry is inherent in high technology products. The transitional or pilot plant stage may bring to light technological problems which failed to show up at laboratory level. Discovery of these would reduce the risk of a high-cost investment such as establishment of a bubble memory factory represents.

Fabricators of the Hungarian bubble memory would have liked the test series to have been completed by the end of 1980, because this would have enabled them to say whether the work was worth continuing independently at home or, possibly, in collaboration with Soviet institutes or whether it would make more sense to cash in on sale of the license of the know-how. Test production, if continued partly with the devices used in research, would require relatively modest investment.

Two strategies are conceivable where mass production is concerned: one is to continue development stage by stage and to begin the investment only after all is known about the first phase. The second would involve proceeding with the investment and ironing out technological problems as they arise. In the first strategy the technology becomes foolproof but obsolete; the second is too risky.

Technicians of MOM (Magyar Optikai Muvek, Hungarian Optical Works) who have participated in bubble memory development with the KFKI from the outset would have liked to combine the two approaches in 1977 at which time they recommended that a pilot plant be set up, because they knew that at least 3 years would elapse before something would be done in regard to this investment; the estimated cost of which would have been 200 million forints. Not much has happened so far, and it is feared that regardless of whether it is decided that it is or is not worth producing bubble memories in Hungary the strategy favoring foolproof but obsolescent technology will automatically go into effect.

A number of enterprises would be capable of production; one of these is MOM which makes mechanical magnetic stores which the bubble memories would replace. However, United Incandescent (Egyesult Izzo) has a profile closer to the actual production technology since its factory in Gyongyos has all the modern equipment for fabricating and encasing integrated circuit chips, and this resembles the process involved in producing bubble memories.

Insofar as use of bubble memories is concerned, little can be said while there are only a few of them. The researchers themselves reined back rather than encouraged the interest of potential users. Bubble memories can be used in many types of equipment ranging all the way from control of machine tools to computer peripherals. In any case, tempo in the modern electronics industry today is dictated entirely by parts production; this is what fuels the fantasy of those who fabricate devices. The bubble memory must be made available to them so that precise determination of its value can be arrived at.

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UDC 681.2:681.326.7:621.3.018.7.083.722

APPARATUS FOR THE TESTING OF MICROPROCESSOR CARDS

Budapest MERES ES AUTOMATIKA in Hungarian Vol 28 No 8, 1980 pp 292-294

EGRI, Karoly, NAGY, Kazmer, SZTRANCSIK, Csaba, and VIDA, Tibor, Research Institute of the Instrument-Manufacturing Industry

[Abstract] The Scale-Development Department of the Research Institute of the Instrument-Manufacturing Industry developed a system for production checking of microprocessor cards for the METRIPOND Scale factory. The relatively inexpensive, programmable, and easy-to-use apparatus checks each card automatically and roughly identifies the faulty area of the cards found defective. The central unit of the apparatus is an INTEL 8080 microprocessor, of which the cards are connected via a bus. The other major components are a power-supply module, a keyboard, and a display unit. The cards can be freely selected provided that a clear address is assigned to each. This is facilitated by address-decoding circuits. Provisions are incorporated to prevent a defective card from damaging the test system. The card tests are programmed for the individual cards according to their functions. Certain tests can also be started from the keyboard. Basically, a test module consists of cyclic output pattern generation, a sequence of appropriate control signals, an imaged expected pattern, and a comparator. The individual pattern fields can be called up cyclically to identify a complex fault. Provisions were incorporated to overcome the problem created by the fact that certain control signals identify practically identical faults. No external peripheral devices are required. Considerable time is saved with this system compared to the conventional card-testing procedures. Figures 2; 2 Western references.

2542
CSO: 2502

UDC 351.824.11:338.984.2:681.5:681.32

CONTRIBUTION OF THE RESEARCH INSTITUTE OF THE INSTRUMENT-MANUFACTURING INDUSTRY TO THE REALIZATION OF THE NATIONAL GAS PROGRAM: THE GAZELLE MICROCOMPUTER-BASED TELE-MONITORING SYSTEM

Budapest MERES ES AUTOMATIKA in Hungarian Vol 28 No 8, 1980 pp 299-303

BEREND, Karoly, KOCZUR, Kalman, and MOLNAR, Janos, Research Institute of the Instrument-Manufacturing Industry

[Abstract] The semiautomatic GAZELLA dispatcher system collects and processes the data of the operation of the gas-receiving and pressure-regulating station of the city of Nagykanizsa, and permits the human dispatcher to intervene in the operation. The system comprises the Station Processor Module (including the PROM and RAM units), the message-traffic control module, the analog-module interface, the parallel I/O interface, and the internal periphery interface. The station collects data from the process, monitors the message traffic, and performs the tasks mandated by the messages. It also monitors the effects of the executed tasks and prepares and executes the interventions in the process. It issues a message if the required intervention is not feasible or possible. The GAZELLA is based on the INTEL 4040 microprocessor and of modular design. It operates on the basis of the continuous interrogation principle (with a 5 sec cycle). Its display shows the processed data in a form readily comprehensible to the dispatcher on a process-diagram panel. It has analog and digital display capability, intervention mechanisms, data printer, and power-supply module. Transmission of signals and messages is via the postal telephone network at the rate of 600/75 Baud. The system has been tried for several months and fully meets the needs of the gas system of Nagykanizsa. Figures 2; 2 Hungarian references.

2542
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HUNGARY

BRIEFS

USE OF HOLOGRAPHY--Holography is an outstanding device for industrial uses. This is proved by the procedure developed and patented by the Technical Chemical Research Institute of the Hungarian Academy of Sciences: It records the phases of physical and chemical reactions at the instant of their occurrence. [Excerpt] [Budapest NEPSZABADSAG in Hungarian 4 Jan 81 p 5]

CSO: 2502

SCIENTIFIC ACHIEVEMENTS IN CLUJ COUNTY DISCUSSED

Meetings With Scientists, Inventors

Bucharest FLACARA in Romanian 18 Dec 80 p 15

/Article by Constantin Mustata: "We Are in a Hurry, We Must Collaborate"/

> /Text/ The bent of the people of Cluj for diligence, research and love of science is well known. A new edition of the action of scientific and technical creation within the "Cintarea Romaniei" /Song of Romania/ National Festival, the third edition, has begun. In a single year, nearly 9,000 objectives have been achieved in the Festival of Labor and Creation. What have these objectives meant for the county's treasury? A great deal!
>
> Let us note some of the results: a production increase of nearly 1 billion and the reduction of material expenses by nearly 200 million lei and of imports by over 200 million lei valuta. The number of inventions patented in this period is over 150.
>
> In recent days, I have been the witness to direct conversations between researchers, designers, university personnel, and representatives of industry. In the space generously provided by FLACARA, we will try to convey a few of the ideas of this dialog of collaboration, worries and hopes for the better.

Prof Dr Docent Victor Mercea is one of the most distinguished personalities of Cluj science and culture. We began the conversation with a problem that has bothered the staff of the Institute of Isotopic and Molecular Technology in Cluj-Napoca for many years: the technologies!

/Victor Mercea/ We make very many unicums. And they are very fine! However, we also need something else: technologies! Here is the problem, technologies are necessary to us for a "series." Unfortunately, the technological research is weak, we still do it poorly.

/Question/ I understand that you have run into this problem....

/Answer/ More than once! The transition to series production or the production of big series is unsuitable precisely due to the technologies. The technology conceived for a unicum or a few products is one thing and the technology for industry is quite another. Hence, lags and delays in introducing our research into production arise. The level of exportation also depends directly on this technology.

[Question] What does the slowness of the introduction into production mean?

[Answer] It means that we find the same product presented in advertisements that come to us 6 months later from abroad....

[Question] What must be done in order to develop creativity?

[Answer] We should care more about the young graduates. They come to the enterprise as probationers, a little bit of work is given to them, eventually bureaucracy. But some heads of enterprises too rarely think that the young physicists have also brought with them creative exuberance and youthfulness and enthusiasm and fondness for solving problems and being useful. We should not clip the wings of the young people. We should teach them to fly. Otherwise they will become scientific functionaries.

Talking about these problems also with Engr Radu Morar, from the Cluj branch of the Institute for Computer Technology, I sensed much anxiety in his being.

[Question] You are the inventor of the first installation in Romanian ionic implantation....

[Answer] This is not only a joy but also a sadness....

[Question] Why?

[Answer] Because we have invested in it together with the collaborators in our laboratory everything good that we had in us. It should have already replaced the similar installations that we import for big money in dollars and brought valuta savings of $400,000.

[Question] And why has it not yet been taken over?

[Answer] Why? Because some still go for specialization, say, to Tokyo, instead of coming to Cluj-Napoca.

And look, also in this peak field of microelectronics another Cluj product awaits its clear path to industry: the inscribers with programmable memories....

I had the chance to talk often with Prof Dr Engr Attila Palfalvi, the rector of the polytechnic in Cluj-Napoca, trained in the school of powder metallurgy, headed by the eminent scientist Alexandru Domsa. The Cluj polytechnic has nearly 10,000 students now, has many research institutes integrated into the faculties and departments. This year alone, it has concluded over 80 research and design contracts, with the trips of the teaching personnel and the students to the plants being more and more frequent.

[Question] What have been the most important achievements on this plane?

[Answer] We have applied ourselves to the optimization of the consumption of electric and thermal power at the Dej Enterprise for Fireproof Materials, "Romania Muncitoare" and the Cimpeni CPL [Wood Processing Combine], to the simultaneous recovery of dust and heat at Turda "Cimentul" and the Dej Cellulose and Paper Combine and to the improvement of burners at the Enterprise for Small Burners and Boilers. At the request of the Turda "Electroceramica" and Cluj-Napoca "Armatura" enterprises, we have achieved some equipment and apparatus for testing the products.... At present, we are working on the preparation of new friction materials and rustproof filters from metal powders, at the request of the "Sinterom" Enterprise....

[Question] What has the polytechnic done in 1980 along the line of the recovery and utilization of scrap?

[Answer] More than in all the other years. We have concentrated our attention on copper, nickel, tungsten, molybdenum and cobalt, together with the Fagaras Chemical Equipment Enterprise, Cluj "Sinterom" and Bucharest "Cinescoape"....

[Question] What innovations have you presented this year?

[Answer] Among others, the model of high-capacity ferroconcrete oil tanks, designed by a staff at the Faculty of Construction, which can serve very well in the place of the metal tanks utilized at present. The leadership of our party and state has instructed that the generalization of these tanks be undertaken as soon as possible.

We have also presented a piece of equipment with numerical control with a step-by-step motor, achieved for the "Metalul Rosu" Enterprise, testing and packages of programs for checking the wafers with integrated circuits achieved in collaboration with the branch of the IPA [expansion unknown].

[Question] What priority problems concern the polytechnic?

[Answer] The organization of joint staffs that would handle the design of complex products, such as the presses of various types for the Heavy Equipment Combine, where we want to participate both in achieving and testing the prototypes and in devising the manufacturing technologies for serial production....

[Question] What displeases you?

[Answer] For instance, that we do not have an engineering museum. Starting with the kindergarten child, it should be possible to see a gearbox. That we do not have a permanent exhibition of technical achievements. That we do not have an idea club. That we do not have a patent library and especially that we do not always find the ways needed to stimulate these activities.... At the second Show of Scientific and Technical Creation "Napotehnica '80," in the "National and World Priorities" section the polytechnic in Cluj presented the "Felas" system of communication by laser beam and the new technologies for recovery of metals in the form of powders, accompanied by the figures that represent the efficiency: 82.5 million lei valuta for tungsten powder, 110.5 million lei valuta per year for copper powder, 432,000 lei valuta per ton for tungsten carbide powder and 4.28 million lei per year for cobalt powder.

Also here, at the polytechnic, let us penetrate into the depths of the Faculty of Electrical Engineering, in a conversation with Prof Dr Engr Arpad Kelemen, the dean of the faculty:

[Question] How are you preparing for the impact with the future?

[Answer] This year, we have spent 90 million lei on equipment and modernization. We are turning to a complete revision of the analytic programs: microelectronics, microprocessors, the generalization of computer technology necessitate the changing of the content of the basic disciplines as well as the applied ones. We know that we have to fight a battle, but this way is the only one to follow.

[Question] How do you see the education-production collaboration?

[Answer] By no means as we sometimes do it now. It must not confine itself to solving on the fly current, secondary problems of the enterprises, but we must work together actively to prepare and put into practice priority themes concerning the introdution of the new technologies.

[Question] Do you have such collaboration?

[Answer] Yes. The design and manufacture of the electronic equipment for adjustment and positioning with step-by-step motors have preoccupied us for more than a decade. There are now provided all the conditions for assimilating this new technology into our industry, whose applications to the construction of machine tools with numerical control, to the achievement of industrial robots, peripheral equipment of computer technology, are spectacular....

[Question] Besides on this plane, the faculty has an important responsibility on a national plane....

[Answer] It is so. In this field we give advice on all the import requests of the various enterprises and institutes.

[Question] Cluj also has an electronics platform now....

[Answer] Yes, but, unfortunately, it does not yet have the manufacturing program established, and it could have been perfected down to the smallest details if there had been cooperation and suitable coordination.

A specialized faculty and three strong research branches operate in Cluj-Napoca. On the date of its going into operation, all the prototypes that would serve as a basis for the production of the Enterprise for Industrial Electronics could have been ready. But anyhow, evidently, the new enterprise is still in search of the profile!

Inventor Dr Engr Constantin Daramet, from "Unirea," is alarmed by the lack of continuity in technological research. The technologies are growing old. They are dying. They must continually be updated. And something else worries him: the most important factories for textile machines in the country are in Cluj-Napoca and in this part of the country, and the Faculty of Mechanics does not have a specialized section that would be concerned with training and improving the specialists in this field.

In recent years, the Cluj "Cero" Institute for the Technology of Glass and Fine Ceramics has become a top presence.

We reproduce a short conversation held with Dr Engr Nicolae Cic_tea, the head of this unit?

[Question] What is the key to this development?

[Answer] The blending of research with microproduction. We are thus taking the research to its conclusion and, in addition, are creating for ourselves funds for the development of research.

[Question] How do you achieve the documentation?

[Answer] The INIT [expansion unknown] must become what it was conceived to be. With sporadic documentary information we cannot progress as we wish. And something else: we have imported into the country many licenses, even some peak ones, such a as, for instance, the technology for synthetic diamonds, at an enterprise in Bucharest. It is a great loss that these licenses are not inventoried and known better. But so many such aspects are not encountered! The Beer Factory in Cluj-Napoca imports some enzymatic deratives and filtering earth, products that could have been achieved long ago right in the municipality of Cluj-Napoca, where two strong research units, the Institute for Mining Research and Design and the Biological Research Center, have concerns and achievements in this direction. Perhaps these lines will also be read by the comrades at the Beer Factory Central and they will find a solution for the whole country. If only because it is a pity for us to bring earth from other countries.... And it is a pity for us to keep many biotechnologists on the shelf, especially now, when, as biologist Doina Cachita stated, their time has come!... Perhaps those interested will learn that the Cluj biologists have perfected new technologies for optimized growth of plants, that they have achieved new formulas for rhizogenic products, which lead to the replacement of imported products, or that they have achieved an installation of their own devising for the intensive cultivation of Spirulina, an unconventional source of proteins utilized in the food industry, zootechny and pharmaceutics. Or how many specialized units know that the water-release valve for train-heating systems, a valve that is imported, has been achieved at the "16 Februarie" IMMR [expansion unknown]? At the Institute of Chemistry, a visible spectrophotometer, utilized for physicochemical analyses, is being achieved by means of microproduction, yielding a savings of 12 million lei valuta per year. Here, too, there are currently being achieved electrochemical sensors, metal-coated fibers, plant-growth stimulators, pheromones, luminofors, insecticides, photoreagents and so many other products that, by means of their performances, rightly place the Institute of Chemistry in Cluj-Napoca among those in which scientific and technical creation goes hand in glove with prospective thought. The Cluj researchers at the only Romanian scientific research and technological engineering institute for the food and refrigerating industry are also performing the same prodigious activity.

The installation for preparing plasma from blood, the water-water heat pump, the air-conditioning installation for ships, the nitrogen-liquefying installation and the thermoelectric module for conversion of solar energy are among the latest achievements of this staff....

But the action of scientific and technical creation within the "Cintarea Romaniei" National Festival has not released so many energies! And so many problems would have been solved long ago if there had been better collaboration in the education-research-production triad.

Each year, "Sinterom" produces spark plugs on the order of millions. The quality control is unwieldly. It urgently needs a robot. One conference was sufficient and the solution came: the Faculty of Electrical Engineering will make a robot;

Each day, the Beer Factory handles millions of bottles. The people at the polytechnic are now thinking of the solution;

The Electric Power Station Enterprise is interested in eliminating the importation of graphite from England. The problem was immediately taken up by the Mining Research Institute for Nonmetal-Bearing Substances;

The "Armatura" Enterprise, a big producer of faucets, is interested in finding a modern method of coating them, in recovering the heat from the cooling water and in devising a technology for making the precision spheres that are used in faucets....

In step with the times, in these years of the scientific and technical revolution, tens of thousands of people in the area of Cluj are thinking and creating.

Interview With Electrical Engineering Dean

Bucharest FLACARA in Romanian 18 Dec 80 p 13

/Interview with Prof Dr Engr Arpad Kelemen, dean of the Faculty of Electrical Engineering at the Polytechnic Institute in Cluj-Napoca, by Virgil Lazar: "A Very Close Competition with the Big Electrical Engineering Schools in the World"; date and place not given/

> /Text/ Arpad Kelemen. Born in 1930 in the Chinteni Commune, Cluj County. A graduate of the Faculty of Power Engineering in Bucharest and, simultaneously, the Faculty of Physics, in 1956. For 2 years, a researcher at the Power Engineering Institute in the capital and then at the Research and Design Institute of Cluj County. In 1960, he became a member of the teaching staff of the Polytechnic Institute in Cluj-Napoca, in the Department of Physics and, later, in the Department of Power Engineering. In 1970, he took his doctorate in Bucharest with the thesis "The Utilization of Induction Motors Controlled by Pulses as Output Regulators." Between 1972-1974, a Humboldt scholarship holder at the University of Nuremberg-Erlangen. He is now a university professor and the dean of the Faculty of Electrical Engineering at the Polytechnic Institute in Cluj-Napoca. He is the author of over 25 inventions—alone or jointly—patented here and abroad, in the United States, England, the FRG and so on, some of them being awarded gold medals at the international expositions in Brussels and Nuremberg. He has published about 60 articles and studies here and abroad and is the author—alone or jointly—of seven specialized volumes. He has lectured as a guest at universities in the United States,

England, the USSR, Belgium and so on. He appears in the selection of biographies "Who's Who in the World." He has been honored with orders and medals of the Socialist Republic of Romania.

[Question] I want to begin this interview with a question springing, I confess, from a certain emotional curiosity: How did you, a native of Cluj, come to do your studies in Bucharest?

[Answer] Indeed, it seem curious, especially if we consider that we, the Transylvanians, are more traditionalistic and that in Cluj-Napoca we have enough institutions of higher learning on whose doors it is possible to knock. It was, first of all, the urging of my mother, who always said to me, "Go farther away, a man has to go out into the world, he should not stay glued to home." The second reason would be my enthusiasm, since secondary school, for electrical engineering and, at that time, there was no such faculty in Cluj-Napoca. I had read, as a student, a little about the Bucharest school of power engineering and had heard of some great professors, who, later, were mine, indeed, illustrious teachers who helped me to mold myself as a specialist.

[Question] Still, still, your home area attracted you eventually; or, as a colleague of yours said inspiredly to me, it "recovered" you. How did things happen?

[Answer] I heard that the problem of modernizing the mass transit was then bothering the people of Cluj or, more precisely, that they wanted to introduce the trolley bus. The county research and design institute made me the offer of this project, more precisely, of the rectifying station. Naturally, I did not hesitate, although, frankly speaking, I had colleagues and professors in Bucharest, some wonderful people from whom I learned a great deal, sharing together great professional joys and satisfactions, some also connected with the project of setting up the Dicas power station, then a case of pioneering in Romania in the matter. In Cluj-Napoca, the impact with life, with the requirements of the economy and of production, was even more direct, in the sense that I was a project chief for much work at the "Unirea," "Tehnofrig" and Ilva plants, the power supply for the new Donath district and even for the first traffic lights in the city. It was an extremely fruitful period for me in the sense that the realities of life, with its difficulties, with its urgent necessities, completed, if you will, my view as a researcher, my general view: to use an expression of ours, of the powermen, I "connected" myself to a multitude--and, sometimes, of great complexity--of factors that a scientist must take into account in everything that he does for the society in which he lives and works. Especially when the society is socialist, that is, at the most evolved stage of the development of human society.

[Question] Comrade professor, alone or jointly with your collaborators, you are the holder of many patents. How did things start? How does a man create new technology? From where do the ideas come to him?

[Answer] I believe strongly that, in particular, study, continual research on all facets of the field with which you are dealing, is the basis of technical and scientific creativity. That is, knowledge in depth, on the vertical, and that on the horizontal, as to everything new that mankind has produced. Otherwise, you find that you have rediscovered America, you invent something that others dropped long ago. As for me, I tried to not deviate from these precepts and had a long period of study: faculty, doctorate, specialization abroad, reading of everything new that appeared. That is, it was a period of quantitative accumulations. Afterwards, of course, there was the eruption like a chain reaction. The first invention, consequently, was a device for adjusting the rotation of the three-phase induction motor--patented in 1970--which opened up wide possibilities of adjusting and positioning a whole range of machine tools, it being applied at units in Ghimbav, Tirgoviste, Baia Mare and so on, either furnished by the faculty or built by users from our designs. Well, the key idea, that from pulse to pulse you can spin the motors in a "step-by-step" state, can measure the distance and position of the movement, generated a whole family of inventions and variants, the principle being patented in nearly the whole world, including the United States, which, this time, had to concede priority to the Europeans, more precisely, to us, the Romanians.

[Question] Consequently, this is "in large" the genesis of the "step-by-step" motor that has aroused so much commotion in the scientific and technical world?

[Answer] Well put "in large," because, "in small," both for me and for Lect Engr Dr Mircea Crivi, the head of the research laboratory, for the other collaborators, it meant days and nights of studies and trials. But eventually we managed to go from the induction motor to the "step-by-step" motor, forging in this field one of the smallest schools in the world, anyhow, ahead of the Americans and the Europeans on the whole. They are motors of great precision, with an electronic system of servo-control, and now conceived and achieved in a great variety. They can control typewriters, computer keyboards, punched tapes, machine tools with numerical control, industrial robots and so on. We have now sold very many units and they are enjoying great success due to the vast area of use, due to the characteristics. Their most recent success was the verification of the possibilities of positioning laser beams in space, an experiment made with the Computer Enterprise in Bucharest. With the help of this motor, in an all-purpose and complex variant, we positioned laser beams and transmitted information between the Intercontinental Hotel and Casa Scinteii, the experiment demonstrating a system of wireless connections of great promise. Anyhow, our motor demonstrated an extremely precise positioning of the beams in the desired space, in the desired directions, in an extremely small unit of time. Which confers on it new prospects of utilization.

[Question] I noted your statement: "...We have now sold very many units...." Should I understand that your faculty has now also formed itself into a firm?

[Answer] In part, yes. Because, while we have made, thus far, 50 units per year in our production shop, we will make series on the order of hundreds in the new section that we are preparing. Of course, when we sense that the market's demands will exceed our forces--you understand: teaching personnel plus students--then we will transfer their production to a specialized enterprise.

[Question] What is the most recent invention of yours patented?

[Answer] A procedure and device for adjusting and positioning the vertical advance of the horizontal-plane grinding machine, a patent signed together with Engr Iosif Crenan from the "Unirea" Enterprise--the user of the invention--with Engr Viorel Trifa and Engr Ambrus Szekeles from our faculty. And the procedure and device for attaching diamonds to the stone of the grinding machines, also for "Unirea." The patents recently came to us. But, along another line of thinking, their users are also students in a way, because each technical innovation causes some theoretical and practical conclusions that amplify the treasury of knowledge. Because we too are training here over 1,500 students, but we are training them not only in the department but also in the production shops, where they train their hands and educate their minds to be able to apply the things assimilated in the courses. I can tell you that the faculty's shop--where the students actually work, furnishing commodity output--has a production capacity of about 150,000 hours and that, this year, it is concluding its balance sheet with an income of about 10 million lei from high-class equipment, much in the sphere of the peak technologies. Because we must fulfill the desire placed before education by the party that, through complete integration with research and production, we become a formidable outpost of Romanian science that would contribute substantially to raising the specialized branches of the economy.

[Question] What you tell us is interesting. Consequently, I would like additional information: What are the ties of your faculty with research and production, besides those mentioned thus far?

[Answer] First, that we have tried and have managed, of course, with the help of the ministry and the other appropriate central bodies, to develop the material base of research. While our assets totaled 6 million lei in 1976, for instance, they now exceed 90 million lei. Just the computer equipment that we have exceeds 50 million lei. From this viewpoint, we are in a very close competition with the best similar schools in the world. To draw you an at all accurate picture of our facilities, I also mention that microelectronics and microprocessors have been introduced as part of the applications in the educational process. And now we have also turned to the improvement of the content and structure of all the material taught, so that we may approach what is more advanced in the world, more up-to-date. At the same time, other actions of great efficiency have also been undertaken, both for the various sectors of the economy and for research and education, since the infusion of ideas, of innovations, will circulate more promptly, in both directions, within the respective triplet. I am referring to the fact that our own research laboratory with a staff of 20 researchers has been organized in the faculty, that, more recently, the branch of the Institute for Automation Research and Design has come under our patronage, it being run by Prof Marius Hanamut, that the branch for electrical-engineering research is now run by Lect Dr Engr Traian Gligor, having in the concerns also the biomedical electronics studied together with specialists from the Medico-Pharmaceutical Institute. We have strengthened the ties with the branch for power-engineering research and have proposed to take up the running of the whole hydroelectric-power complex in Apuseni by means of computers. And when we move to the new headquarters in Dealul Feleacului, where a modern electronics platform is coming into being, we will be--like the Faculty of Mechanics on the Somes-Nord platform--implanted into the problems and the heart of the production processes in the most intimate way. Because the homeland, this beautiful and sacred country that is called Romania, needs highly qualified specialists, capable of taking over and carrying farther and higher the baton of the generation of today.

[Question] I note gladly that your experience as a researcher and a teacher is also shared by prodigious publishing activity.

[Answer] The generation of tomorrow, and even of today, needs to know how much and how far we have built. And the specialized literature is a means of leaving something durable. Because an invented machine can die soon due to obsolescence. But the principles, the theories, the conclusions of research, remain as living ideas for the minds of the younger generation, which must, which has the duty to, add new links to the chain of science. Consequently, I feel that to commit to paper your thoughts, what you believe to be new or improved, is a leading duty for a teacher and a researcher. With these mental impulses I have published, alone or in collaboration with Maria Imecs, Mircea Crivi and Viorel Trifa, volumes like "Sisteme de Comanda si Reglare Incrementala a Pozitiei" [Systems for Control and Incremental Adjustment of Position], "Motoare Pas cu Pas" [Step-by-Step Motors], "Actionari Electrice" [Electric Drives], Volume 1 (Volume 2 is in the process of publication), and so on. It should be noted that on the first mentioned volume I also obtained the collaboration of Univ Prof Dr Engr Benjamin C. Kue of the University of Illinois (United States), a world-famous scientist, who, in his widely circulated works, did us the honor of publishing the bibliography of our research, which of course pleased us.... By means of all these things we do not intend but to raise the Cluj school of electrical engineering both as an institution of higher learning and as a research center to a level capable of facing the competition of any similar school in the world. Because, at the present time, so quick in changes, the past is interesting, the present is imperative, but the future concerns us acutely.

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